PATENT SPECIFICATION (11) 1 557 285

1 557 285

(21) Application No. 44379/76 (22) Filed 26 Oct. 1976

(31) Convention Application No. 2547967 (32) Filed 27 Oct. 1975 in

(33) Fed.Rep of Germany (DE)

(44) Complete Specification Published 5 Dec. 1979

(51) INT. CL.[2] C09D 11/02 11/10 11/12

(52) Index at Acceptance
C4A C12B C12C C12G C14 C16 C17 C2
C5B C6C C7 C9A C9B
C3V AD AE

(19)

(54) PRINTING INK CONTAINING A WAX FOR PRINTING MATERIAL IN SHEET FORM

(71) We, BASF AKTIENGESELLSCHAFT, a German Joint Stock Company of 6700 Ludwigshafen, Federal Republic of Germany, do hereby declare the invention, for which we pray that a Patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:-

The present invention relates to the printing of materials in sheet form with a printing ink containing a wax, and to the printing ink itself.

The addition of a small amount of polyethylene wax to printing inks, in order to obtain prints of improved scuff resistance, has been disclosed. The polyethylene wax is added to the printing inks in the form of a dispersion in toluene or gasoline. However, it is not possible to use the conventional polyethylene wax dispersions for aqueous inks, eg. for aqueous flexographic inks and gravure inks, because the wax dispersions are not miscible with these printing inks. It is true that aqueous wax dispersions can also be employed, but the emulsifier content of the dispersion has an adverse effect on print quality. Furthermore, aqueous wax dispersions are immiscible with printing inks which contain organic solvents.

The present invention seeks to provide a wax dispersion which can be added both to aqueous printing inks and to printing inks based on organic solvents, eg. ethanol, ethyl acetate, toluene or gasoline.

According to the invention there is provided printing ink containing from 0.5 to 5% by weight, based on its solids content, of an oxidized polyethylene wax which has been added to the printing ink in the form of a dispersion in diethylene glycol mono-n-butyl ether (= butyldiglycol), the dispersion having been obtained by dissolving the oxidized polyethylene wax in the glycol ether at elevated temperature, and cooling the solution. The invention further provides a process for printing material in sheet form with a printing ink, wherein a printing ink according to the invention is used.

Oxidized polyethylene waxes are commercially available. They may be obtained by oxidizing polyethylenes manufactured from ethylene by high pressure or low pressure polymerization. The molecular weight of the oxidized polyethylene waxes is suitably from 1,000 to 12,000, preferably from 2,000 to 6,000. The oxidized polyethylene waxes suitably have an acid number of from 10 to 30, preferably from 15 to 25.

Butyldiglycol is also commercially available. Examples of methods of manufacture of the dispersion of the oxidized polyethylene wax in butyldiglycol are to mix the oxidized polyethylene wax and butyldiglycol at room temperature and heat and mixture until the wax dissolves, or to add solid oxidized polyethylene wax to the heated butyldiglycol. On cooling, the oxidized polyethylene wax separates out from the clear solution in the form of fine crystals. The dispersion can be homogenized by means of a high-speed stirrer or an Ultra-Turrax apparatus (ULTRA-TURRAX is a Registered Trade Mark). To achieve optimum dispersion, it is at times advantageous to subject the dispersion of the oxidized polyethylene wax in butyldiglycol to an after-treatment in a ball mill or similar machine.

In order to dissolve the oxidized polyethylene wax, the butyldiglycol is as a rule heated at from 105 to 150°C. Preferably, the wax is dissolved in butyldiglycol at from 110 to 120°C. It is possible to manufacture dispersions of oxidized polyethylene waxes in butyldiglycol which have a solids content of from 5 to 40% by weight.

From 0.5 to 5% by weight, preferably from 2 to 4% by weight, of the oxidized

polyethylene wax, based on the solids content of the printing inks, are added to the latter. The polyethylene wax dispersions may be added to printing inks based on aqueous solvents or on organic solvents. The preferred use of the dispersions of the oxidized polyethylene wax in butyldiglycol is as an additive to aqueous flexographic inks and gravure inks. These inks are also commercially available. Because of the more stringent requirements of environmental protection, and also for cost reasons, the use of aqueous flexographic inks and gravure inks has in recent times gained great importance. These inks are used to produce prints on material in sheet form, for example paper, wallpaper, plastic films, eg. films of polyolefins, especially polyethylene and polypropylene, polyesters and polyamides, and metal foils, eg. aluminum foil. Particularly scuff-resistant prints are obtained by adding a dispersion of oxidized polyethylene waxes in butyldiglycol. This property is of importance in, for example, the printing of magazines, catalogues and packaging materials.

The Example which follows illustrates the invention. In the Example, parts and percentages are by weight.

EXAMPLE

30 parts of an oxidized polyethylene wax which has a molecular weight of 3,950 (determined by melt viscometry) and an acid number of 27, were dissolved in 70 parts of butyldiglycol at 150°C, whilst stirring. On cooling the clear solution to about 98°C, the oxidized polyethylene wax separated out as fine crystals. The dispersion obtained was after-treated in a ball mill for 7 minutes. 2%, in each case based on solids, of the resulting stable dispersion of the oxidized polyethylene wax in butyldiglycol were added to the flexographic and gravure inks shown below. Prints were then produced with these printing inks on a great diversity of materials:

a) Aqueous flexographic printing ink consisting of 10 parts of an organic pigment based on a commercial blue copper phthalocyanine, and 88 parts of a binder solution comprising 25% of a commercial phthalic acid ester resin which is free from fatty acids, 3.3% of 25% strength ammonia, 1.7% of butanol and 70% of water. The aqueous flexographic ink is used to print paper, parchment and board.

b) Aqueous wallpaper printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine, and 90 parts of a binder solution comprising 40% of an ammonia-neutralized commercial thermoplastic acrylate resin dissolved in a 2:1 mixture of i-propanol and water, and 60% of water. The aqueous printing ink thus obtained is used to print wallpapers.

c) Packaging printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine, and 90 parts of a binder solution comprising 14.4% of nitrocellulose A 400, 3.1% of dibutyl phthalate, 20% of ethyl acetate, 3% of ethylglycol and 59% of ethanol. The printing ink thus obtained is used to print paper, aluminum foils and regenerated cellulose films.

d) Packaging printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine, and 90 parts of a binder solution comprising 30% of a commercial polyamide resin based on dimerized fatty acids and diamines, 40% of n-propanol and 30% of gasoline (boiling range 100 - 140°C). The printing ink obtained is used to print high and low pressure polyethylene films and polypropylene films.

e) Illustration gravure printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine and 90 parts of a binder solution comprising 40% of a phenol-modified rosin and 60% of toluene.

f) Illustration gravure printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine and 90 parts of a binder solution comprising 50% of zinc resinate and 50% of gasoline of boiling range 100-140°.

The printing inks described under e) and f) are employed for printing illustrated magazines and catalogs.

WHAT WE CLAIM IS:

1. Printing ink containing from 0.5 to 5% by weight, based on its solids content, of an oxidized polyethylene wax, which has been added to the printing ink in the form of a dispersion in diethylene glycol mono-n-butylether, the dispersion having been obtained by dissolving the oxidized polyethylene wax in the glycol ether at elevated temperature and cooling the solution.

2. Printing ink as claimed in claim 1, wherein an oxidized polyethylene wax which has a molecular weight of from 1,000 to 12,000 and an acid number of from 10 to 30 is employed.

3. Printing as claimed in claim 1 or 2, wherein from 2 to 4% by weight of oxidized polyethylene wax, based on the solids content of the printing ink, are employed.

4. Printing ink as claimed in any of claims 1 to 3, wherein a dispersion of an oxidized polyethylene wax in the glycol ether which has a solids content of from 5 to 40% be weight is employed.

5. Printing ink as claimed in any of

claims 1 to 4 which is a water-based ink.

6. Printing ink as claimed in claim 5, which is an aqueous flexographic or gravure ink.

7. Printing ink as claimed in any of claims 1 to 4 which is based on ethanol, ethyl acetate, toluene or gasoline.

8. Printing ink as clamed in claim 1 and substantially as described in the foregoing Example.

9. A process for printing material in sheet form with a printing ink, wherein a printing ink as claimed in any of claims 1 to 8 is employed.

10. Paper, wallpaper, plastics films and metal foils which have been printed by a process as claimed in claim 9.

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Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1979.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.